GUIDE FOR SHORELINE LIVING

SHORE STEWARDS

SHORE STEWARDS BOOKLET

TABLE OF CONTENTS

Introduction to Hood Canal 1
Guideline 1 – Use Water Wisely 3
Guideline 2 – Know and Practice All the Elements of Septic Maintenance . . . 9
Guideline 3 – Control Pests Safely 19
Guideline 4 – Manage Water Runoff 24
Guideline 5 – Encourage Native Plants and Trees 32
Guideline 6 – Know the Permit Procedures for Shoreline Development 40
Guideline 7 – Develop on Bluffs with Care 45
Guideline 8 – Use Soft Armoring Techniques When Appropriate 51
Guideline 9 – Respect Intertidal Life While on the Beach and Boating 55
Guideline 10 – Preserve Eelgrass Beds and Forage Fish Spawning Habitat 61
Quick References 66
Other Resources 67

Content and editing by the Water Resources Team:

Bob Simmons, WSU Extension Mason County Director

Pat Pearson, WSU Extension Jefferson County Natural Resources/Stewardship Coordinator

Teri King, Washington Sea Grant Marine Water Quality Specialist

Anne Nelson, Washington Sea Grant Marine Water Quality Specialist

Additional content and editing by:

Emily Piper, WSU Extension Mason County Water Resources Associate

Cammy Mills, WSU Extension Jefferson County Shore Stewards Coordinator

Special thanks to the following for the original Shore Stewards concept and booklet:

Don Meehan, WSU Extension Island County Director

Gary Wood, Island County Marine Resources Committee Director

Scott Chase, WSU Extension Island County Shore Stewards Coordinator

Brittany Stromberg, WSU Extension Island County Shore Stewards Coordinator (2001-2003)

Hood Canal is a unique and spectacular place to call home. It offers beautiful scenery, ample opportunity for recreation and wonderful fish and shellfish. It is important to take care of the land and waters of Hood Canal so that the habitat for fish and wildlife and other wonderful qualities that have drawn so many to the area are all preserved.

Sadly, Hood Canal has experienced problems due to low levels of dissolved oxygen. You may have heard about fish kills in Hood Canal that are the result of these low dissolved oxygen levels. While the causes of the low dissolved oxygen are not fully understood, a number of factors seem to influence dissolved oxygen levels including the natural geology of Hood Canal and input of excess nutrients.

With a growing population and number of businesses in the Hood Canal watershed, there has been an increase in the amount of nutrients that enter Hood Canal's waters. These nutrients can come from a number of sources including septic systems, stormwater runoff, salmon carcasses, agriculture (animal) waste, forestry and other discharges. When these nutrients enter the water, they provide food for algae causing large blooms. Initially the algae contribute more oxygen, but this benefit is small and occurs near the surface of the water. Eventually the algae die, sinking to the bottom where they are consumed by various organisms. Unfortunately, these organisms use oxygen in the process of breaking down the algae. Because there is so much algae to break down, there is little oxygen left for other marine organisms. The result is a low level of dissolved oxygen, possible fish kills and an ecosystem which is chronically stressed.

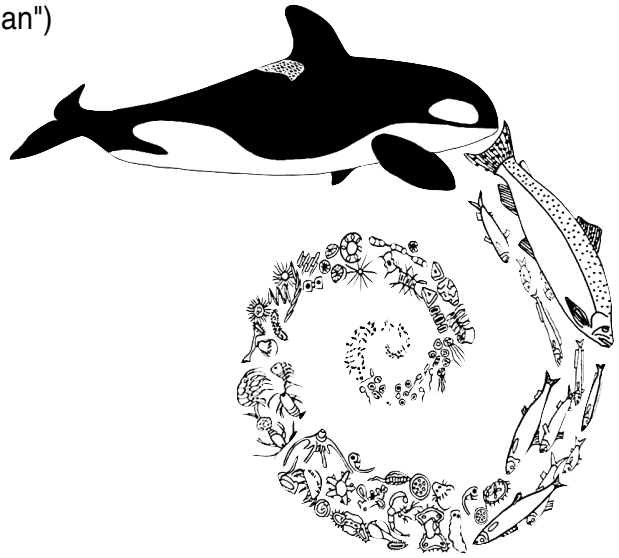
The geology of Hood Canal also contributes to the low dissolved oxygen problem. There is a natural sill or shallow spot at the north end of Hood Canal, just south of the Hood Canal Bridge. This sill, together with the great depth of Hood Canal, limits the flow of

marine water in and out of Hood Canal which means that water rich in oxygen from the sea is slow to make its way into Hood Canal, especially the southern areas. When oxygen rich water does enter Hood Canal it tends to stay on the surface because the waters of Hood Canal are stratified. This means that the water deep below the surface (where the decomposition of algae takes places) may take up to a year to be circulated so that it can receive oxygen.

BIBLIOGRAPHY

Work Plan for U.S. Geological Survey Studies Addressing Low Concentrations of Dissolved Oxygen in Hood Canal, available at http://wa.water.usgs.gov/ projects/hoodcanal/ (Click on the link for "Publications and Products")

Hood Canal Low Dissolved Oxygen Preliminary Assessment and Corrective Action Plan available at http://www.psat.wa.gov/Programs/hood_canal.htm (Click on the link for "Preliminary Assessment and Corrective Action Plan")

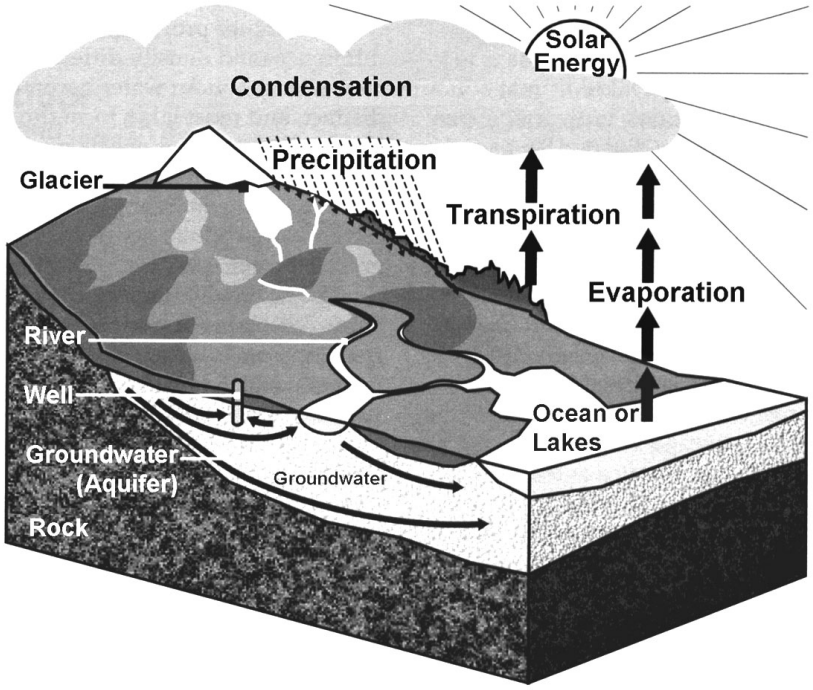


WATER IS A LIMITED RESOURCE

The water that we pump from wells is recharged (or re-filled) solely by the rain or snow that falls on the soil and slowly works its way down into water-bearing zones. These zones are called aquifers. *For more information on the interaction between rainfall and our geology, refer to Guideline #4, Manage Your Groundwater.*

Conserving water is a good idea for several reasons. When you conserve water you ensure that as much water as possible can stay in the natural environment which keeps our streams flowing during our dry periods. This benefits many organisms including salmon. Conserving water can also help keep a septic system functioning properly since too much water floods the system. Using less water in your home means a lower water bill.

ILLUSTRATION: THE HYDROLOGIC CYCLE Source: Washington Lakes Protection Association



WAYS TO CONSERVE WATER

There are many things you can do, both inside and outside your home, to conserve water.

IN YOUR HOME:

- Check toilet for leaks by placing two or three drops of food coloring in the toilet reservoir and checking the bowl (without flushing) for the appearance of color.
- Install a low-flow or ultra-low flow toilet or place a half-gallon plastic bottle filled with pebbles in the tank. Be sure the bottle doesn't interfere with the flushing mechanism. Do not use a brick in the tank as bricks may break down and pieces can get caught in the mechanical parts of the toilet.
- Fix leaky faucets. Even a small drip can easily waste 20 gallons of water each day.
- Install a water-efficient showerhead and take shorter showers.
- Turn off the water while brushing your teeth.
- Use dishwashers and washing machines only with full loads.
- Use a broom to clean walks and driveways, not a hose.
- Install a water meter if you don't have one, and keep track of your water usage.
- Take monthly readings and make a table to track your water usage. See how well your water-saving measures are working.

IN YOUR YARD AND GARDEN:

- To decrease water loss from evaporation, water during the early morning or evening and avoid watering when it's windy.
- Use a soaker hose or drip irrigation system for garden beds.
- Water less frequently and for a longer duration. Light watering

tends to encourage shallow root growth that makes plants more susceptible to droughts.

- Lawns west of the Cascades only need about one inch of water per week during hot, dry weather. Apply no more than 1/2 inch of water per hour depending on type of soil and its absorption rate.
- Weekly watering should be sufficient for most plants during the summer.
- Consider landscaping in a way that requires little or no watering instead of lawns. Native plants usually require less care and water.
- Place 2-4" inches of mulch around plants and trees to reduce evaporation and minimize watering requirements.
- Monitor your watering to prevent runoff from occurring.
- Arrange sprinklers so that they don't water the street, the driveway or sidewalks.
- Use only hoses with a shutoff nozzle.

TYPICAL WATER CONSUMPTION

In this country, the in-home use of water averages about 80-100 gallons per day, per person. That's 29,000 to 36,000 gallons per year per person. This does not include lawn, garden and other outdoor uses of water. So where does all this water go?

Activity	Gallons Used
Flushing conventional toilet (per flush)	5
Showering (per shower)	30
Bathing (per bath)	40
Brushing teeth (per person)	1

Washing dishes by hand (per load)	30
Dishwasher (per load)	15
Washing machine (per load)	35
Cooking meal (per person)	3
Washing car (per car)	20
Watering lawn/garden for 30 min.	240

DID YOU KNOW? A conventional toilet is perhaps the single biggest water guzzler, accounting for 38% of the water used in the average home. By replacing old toilets with the new low consumption toilets you may permanently reduce your overall water consumption by 25% or more.

The following table provides some examples of water-saving devices in *gallons per typical use*. Source: *Home Water-Saving Methods*, WSU Extension Publication EB0732

	Conventional	***Low Use***
Toilet	3.5-5.0	1.6
Faucet	3.0	2.5
Washing machine	35.0	21.0
Showerhead (6 minute shower)	30	15

TIP: A high efficiency washing machine uses 30-50% less water, which is equivalent to about 5000 gallons per year, 50-60% less energy and 1/3 less detergent.

SEAWATER INTRUSION (SALT WATER INTRUSION)

As the population increases, the demands placed on our groundwater resources also increase. As a result, certain areas around Hood Canal (Jefferson County and areas of Kitsap County) have significant saltwater intrusion problems. Some wells are at risk of becoming unusable.

Seawater intrusion is the underground flow of salt water into wells and aquifers. It occurs near a coastline when fresh water is withdrawn faster than it can be recharged. Seawater intrusion can increase the salt content of the well water to unsafe levels for human consumption.

HELPFUL RESOURCES FOR USING WATER WISELY

Seawater Intrusion

Jefferson County Department of Community Development
360-379-4450

Jefferson County Seawater Intrusion homepage
http://www.co.jefferson.wa.us/commdevelopment/SEAWATER%20INTRUSION.htm

Keith Folkerts
Kitsap County, DCD, Natural Resources Coordinator
360-337-7098

Water quality issues

Jefferson County Public Health
360-385-9400
http://www.jeffersoncountypublichealth.org/

Kitsap County Health District
360-337-5235
http://www.kitsapcountyhealth.com/

Mason County Department of Environmental Health
- Shelton office 360-427-9670 ext. 352
- Belfair office 360-275-4467 ext. 352
http://www.co.mason.wa.us/envhealth/default.shtml

Water conservation

Municipal Research and Service Center of Washington, Water Conservation page:
http://www.mrsc.org/subjects/environment (Click on the "Water Conservation" link)

Home Water Saving Methods, WSU Publication EB 0732
http://cru.cahe.wsu.edu/CEPublications/eb0732/eb0732.pdf

WSU Extension Drought Alert website:
http://drought.wsu.edu

BIBLIOGRAPHY

Water Conservation: Guidelines to Being Waterwise, available from Washington State Department of Health at 800-521-0323

Home Water-Saving Methods, WSU Extension Publication EB0732 Available for free download or purchase at: http://cru84.cahe.wsu.edu/cgi bin/pubs/search.html?id=7wgQwwKx Or by calling 800-723-1763

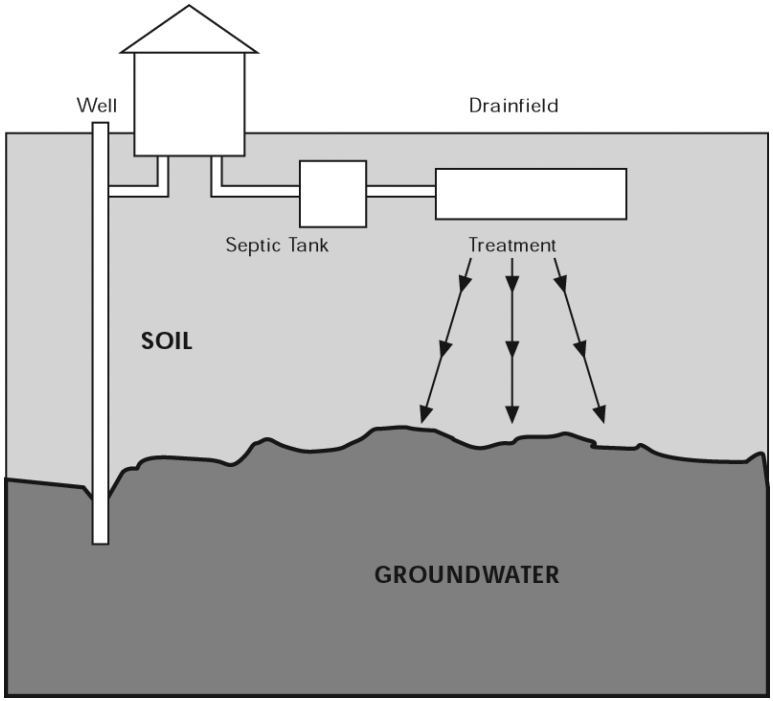
For a list of additional website resources, please visit: www.hoodcanalwatershed.org

HOW A SEPTIC SYSTEM WORKS

Household wastewater flows into the septic tank, where heavy solids settle to the bottom forming a sludge layer, while grease and lighter solids float to the top forming a scum layer. As additional wastewater enters the tank, the wastewater between the scum layer and sludge layer is pushed or pumped through other components of the tank and eventually into the drainfield for final treatment and disposal in the soil.

The scum and sludge layers accumulate and remain in the tank, where bacteria work to break them down. The solids cannot be fully digested so they will eventually fill up the tank and need to be pumped out before they push into the drainfield.

ILLUSTRATION: THE SEPTIC TANK AND DRAINFIELD
Source: Island County Health Department



INSPECTING AND PUMPING YOUR SYSTEM

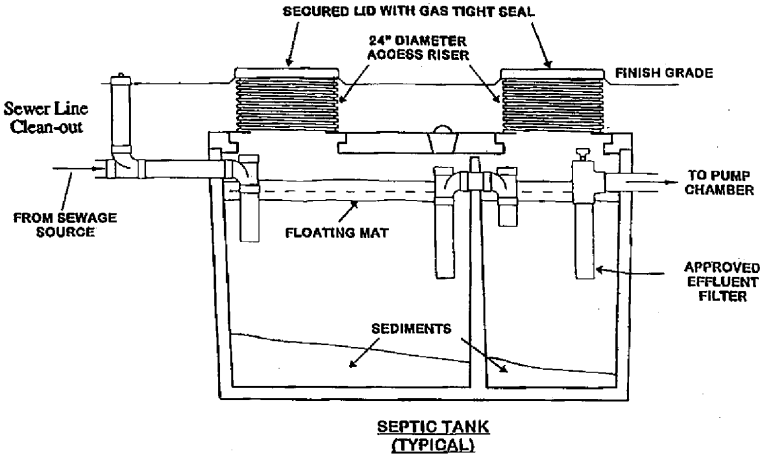
Inspect the scum and sludge layer levels inside the tank once a year to monitor when it should be pumped. Pumping should be done whenever the bottom of the scum layer is within 3 inches of the bottom of the outlet tee or the top of the sludge layer is within 12 inches of the bottom of the outlet tee. Family size and use of the system may require the pumping frequency to be more or less often. Keep a schedule of tank maintenance and pumping.

TANK AND DRAINFIELD LOCATION

The location of your tank and drainfield are important. Your tank should be located a distance from your home as specified in the local building codes. Your drainfield should be located at least 100 feet away from your well, and that of your neighbors, to avoid contamination of your drinking water. It is recommended that you keep a sketch of where your septic tank and drainfield are located for quick reference in the future. If you don't know where your septic system is, contact your local health jurisdiction. They should have a copy of your system plan on file.

Water runoff from your roof gutters, downspouts, patios and driveways should be diverted away from your septic tank drainfield areas as the excess water floods the soil treatment area. By flooding the treatment area you are putting more water in than it was designed to handle. The result is that treatment is bypassed and untreated waste may be released. If you have a water softening system, you should also avoid discharging the system into the septic tank or onto the drainfield.

ILLUSTRATION: A SEPTIC SYSTEM Source: Washington State Department of Health illustrations enhanced by the Washington Sea Grant program



OTHER DRAINFIELD AND RESERVE AREA POINTERS:

- Do not build any structures, such as sheds or greenhouses, on your drainfield.
- Do not pave the area over your drainfield, or place non-permeable materials (like plastic) over it.
- Avoid driving over, or parking on, your drainfield or reserve area. Unnecessary weight compacts the soil, harming the effectiveness of your drainfield. It can be expensive to repair or replace a drainfield.
- Plant shallow-rooted native plants or drought-tolerant grasses. Don't water or fertilize plantings over a drainfield. The plant should get all the nutrients and water they need for survival from the wastewater.
- Trees should not be planted any closer to the system than twice the length of the mature tree as the roots can break the pipes and possibly enter the septic tank. Shrubs and hedges should be avoided for the same reason. Planting vegetables (especially root vegetables) over the septic tank and drainfield is not recommended.
- Do not burn brush piles on your drainfield.

SEPTIC SYSTEM FAILURE

So much of the septic system action takes place underground that it's hard to tell if your system is doing its job. A failed septic system along the shoreline can contaminate the intertidal area with bacteria (fecal coliform) and other pollutants. The runoff makes shellfish from these sites inedible and can cause nearby waters to be unhealthy for wading or swimming. Here are some indicators of a potentially failing system:

- Water pooling in your yard or accumulating elsewhere up or downhill from your septic tank.
- Foul odors.
- Dark grey or black stains in soil of the drainfield or surroundings.
- Poorly flushing or backed-up toilets and sinks.
- Algae growth on drainage pipe outlet, bulkhead or as visible seeps on the beach.

If you notice any of these signs, you need to find out why they are occurring. Contact your health department or a septic system professional for advice.

WHAT SHOULD GO INTO YOUR SEPTIC SYSTEM

Only three things should go into your septic system on a regular basis—human waste, toilet paper and water from everyday bathing and washing activities. Reading product labels is critical in knowing whether something can be safely flushed or washed down into your septic system.

Non-toxic household cleaners, dish washing products, laundry soaps, etc. are widely available and are not harmful to your system when used in moderation. Products with a "danger" warning

should not be used. Instead try using different cleaning methods. For recipes for non-toxic household cleaners, see "Back to Basics" available for free download through Washington State University's website. Liquid laundry and dishwasher soaps should be used whenever possible to avoid clogging baffles and pipes.

TIP: If you are using your washing machine, try to do only one load a day. It's wise to limit the amount of water put into a septic system and spread it out through the day and week. Typical water use is approximately 80-100 gallons per person per day. More than that can overload your system. For more pointers on water conservation, refer to Guideline #1, Use Water Wisely.

WHAT SHOULD NOT GO INTO YOUR SEPTIC SYSTEM

Toilet tissue is meant to go into your septic tank. There are other items you might use that will not decompose, and should be thrown in the garbage instead of flushed. If not disposed of properly, they will fill up the tank or harm the beneficial bacteria that keep your septic system functioning properly.

PRODUCTS THAT CAUSE PROBLEMS IN SEPTIC TANKS:

Facial tissues
Paper towels
Disposable diapers
Rags
Cat litter (even the flushable kind)
Plastic
Coffee grounds
Grease
Cooking oils
Newspapers
Cigarette butts
Matches
Sanitary napkins
Tampons and/or applicators
Dental floss
Hair from hairbrushes, etc.

DANGEROUS CHEMICAL PRODUCTS THAT CAN KILL YOUR SEPTIC TANK AND DRAINFIELD BACTERIA:

Gasoline	Solvents
Motor oil	Lye-based drain openers
Paint (both latex and oil based)	Fertilizers
Paint thinner	Pesticides

GARBAGE DISPOSALS, DRAIN OPENERS AND PAINT

A garbage disposal grinds food and deposits it in your septic tank filling it more quickly, and forcing you to have it pumped more often. Ground food also contains nitrogen, the substance which may contribute to dissolved oxygen problems in the Canal. It is important to note that conventional septic systems are not designed to remove nitrogen. By eliminating your garbage disposal you can reduce up to 10% of the nitrogen that enters your septic system and could end up in Hood Canal. Placing a micromesh screen over your kitchen drains will help reduce another 3-5% of the nitrogen load by removing the fine food particles.

If your pipes or toilet get clogged, do not use lye based drain openers. These kill the beneficial bacteria in your tank. Try using a half cup of vinegar and a half cup of baking soda down slow drains. Wait a half hour then rinse the mixture down with a kettle of boiling water. If this doesn't work, a "snake" is the best way to clean your pipes. If you use a micromesh screen available at local hardware stores, you will eliminate much of the material going down your drain that causes clogs.

Do not clean paintbrushes in your sink. Thinners and solvents can be re-used and then recycled at the transfer station/dump. Paintbrushes can be wrapped in plastic and frozen in between use. If you used latex paint, wash your paintbrush out over your

lawn but make sure to do this as far from the water's edge as possible. If you have a larger amount of paint to rinse out and you live in Kitsap or Mason counties, rinse paintbrushes out over a bucket then take the diluted paint to a hazardous waste facility (contact the Counties' solid waste department for hazardous waste facility locations). (Jefferson County does not accept paint but if you contact the Jefferson County hazardous waste facility they can direct you to a number of places that will sell leftover paint.)

SEPTIC TANK ADDITIVES

Do not waste your money. There are chemical additives on the market that claim to improve the "health" of your system so you won't need to pump as frequently. These chemicals are costly and unnecessary. Although they will probably not hurt your system, they won't help it. None have been shown to be effective. In fact, proof of effectiveness is not required for marketing in Washington State.

HELPFUL RESOURCES FOR MAINTAINING YOUR SEPTIC SYSTEM

Septic Maintenance

Jefferson County Public Health
360-385-9400
www.jeffersoncountypublichealth.org/

Kitsap County Health District
360-337-5235
http://www.kitsapcountyhealth.com/

Mason County Department of Environmental Health
- Shelton office 360-427-9670
- Belfair office 360-275-4467
http://www.co.mason.wa.us/envhealth/default.shtml

Washington Sea Grant Program
Septic Sense website
http://www.wsg.washington.edu/research/ecohealth/septic.html
(Click on the link for "Septic Sense, Scents and Cents")

WSU Extension Publication Creative Cleaning: Back to Basics
Available for free download or purchase at:
http://cru84.cahe.wsu.edu/cgi-bin/pubs/EB1758.html
Or by calling 800-723-1763

For a range of onsite resources from the Dept. of Health, Washington Sea Grant and WSU see:
http://mason.wsu.edu/WaterQual/

Solid Waste Departments

Jefferson County Solid Waste Division
360-385-9243
http://www.co.jefferson.wa.us/publicworks/solidwaste/default.asp

Kitsap County Solid Waste
360-337-5777
http://www.kitsapgov.com/sw/default.htm

Mason County Solid Waste
360-427-5271
http://www.co.mason.wa.us/utilities_waste/default.shtml

To get micromesh screens in Mason County
Janis McNeal
Washington Sea Grant Program
360-432-3054

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On-site Sewage System Homeowners Manual for: gravity, pressure distribution, mound, sand filter, and proprietary devices. All available at:
http://www.wsg.washington.edu/research/ecohealth/septic.html

Pumping Your Septic Tank - Washington Sea Grant Program. Available at:
http://www.wsg.washington.edu/research/ecohealth/septic.html

Landscaping Your Septic System - Washington Sea Grant Program. Available at:
http://www.wsg.washington.edu/research/ecohealth/septic.html

Caring for Your Septic System, available from the Island County Department of Health.

National Technical Information Service: 800-553-6847

For a list of additional website resources, please visit: www.hoodcanalwatershed.org

COMMON SENSE ON PESTICIDES

Most pesticides are synthetic chemicals that may have harmful effects on non-target plants and animals, including pets, humans and some beneficial insects that are desirable for pest control. Even some of the 'safer' alternatives such as copper-based products can be harmful to the environment. Many are slow to break down and may end up contaminating surface water runoff and groundwater. You can eliminate or reduce the use of dangerous chemicals and still control unwanted plants or animals by using the following methods.

TIPS TO LIMIT PESTICIDE USE

- Native plants create beautiful, beneficial and low maintenance gardens. They seldom need pesticide or fertilizer and require little or no watering once established.
- Native plants create an environment friendly to beneficial insects and animals. These insects provide pollen and nectar from a variety of plants throughout the growing season.
- Healthy gardens need healthy soils. Use composts to boost soil health and microorganisms that create a hardy environment for your garden.
- Insecticides can often harm the soil microorganisms needed for healthy soils.
- According to Washington State University, healthy plants that are attacked by pests produce chemicals that attract beneficial insects. Keep your plants healthy by giving them compost and mulch.
- Plants can bear some pest damage. Try to tolerate some pests.
- For almost every pest there is another organism that preys on it.

By using some "broad spectrum" pesticides you may be killing the natural predators of the pest.

- Horticultural oils, insecticidal soaps and the bacteria Bacillus thuringiensis (Bt) are sometimes referred to as "soft pesticides." They do less damage to beneficial insects.
- When using any pesticide product, follow the directions carefully and use them only when they are appropriate. Even then, use them sparingly. The goal is to decrease the use of chemicals.

For more information on the benefits of native plants, please refer to Guideline #5, Encourage Native Plants and Trees.

WEED CONTROL

- Mulch flower beds.
- Hand weed (or mulch where appropriate) vegetable beds.
- Hand-pull, hoe or mow weeds before they set seed.
- Eliminate areas in which weeds grow readily and focus on native plants.
- Do not expect to eradicate weeds completely.

SLUG CONTROL

- Use slug traps such as a bowl of beer placed so that the rim is level with the ground.
- Hand pick slugs at night.
- Keep the garden free of debris (home to slug eggs).
- Keep grass near garden trimmed.
- Avoid heavy ground covers near susceptible plants.
- Use iron phosphate instead of metaldehyde, which is harmful to dogs and cats.

TENT CATERPILLAR CONTROL

- Act fast! At first signs of caterpillars, remove promptly with strong spray of water.
- If there are more caterpillars than can be sprayed off, remove caterpillar nests by pruning. Dispose of them in a sealed paper bag in garbage or compost pile.
- If pruning fails to solve the problem, use the biological insecticide Bt (Bacillus thuringiensis), which acts as a stomach poison for all caterpillars.
- There are beneficial insects that eat tent caterpillars. These predatory insects help keep the tent caterpillar populations in check. In fact, they are partly responsible for the annual fluctuation we see in the tent caterpillar population.

DISPOSING OF PESTICIDES

If you have switched to "soft" pesticides (safer alternatives) and discover other unused pesticides around the house or garage, remember all pesticides are considered hazardous waste and must be disposed of at a hazardous waste site. In Washington it's illegal to dump them in the trash or down the drain. Some counties have hazardous waste round-ups for your convenience.

GREEN LAWNS

Many of us have a love affair with vast green lawns. But our "perfect" lawns have become huge consumers of water, fertilizers and pesticides and a significant source of water pollution from runoff. One solution is to reduce the size of your lawn by replacing grass with native plants that require less water than lawns and provide food and habitat for wildlife. It is especially beneficial to create a buffer of native plants along your shoreline to reduce runoff.

If you choose to maintain a lawn there are a number of things you can do to minimize the cost and amount of labor involved and the overuse of water.

For the Northwest, a healthy lawn is a medium "meadow" green color. Healthy lawns start with healthy soils. Use compost, aerate soils, and leave grass clippings in place to build soil nutrient reserves and biodiversity.

FERTILIZER

The methods above should go a long way in making your lawn beautiful and could eliminate the need for fertilizers altogether. If you find that the previous methods of lawn care are insufficient then apply organic or time-released fertilizer sparingly, making several applications over a period of time instead of a single large application. Also be sure to fertilize more than 24 hours before forecasted rain. These measures ensure that fertilizers stay on your lawn instead of washing into Hood Canal. September is the best month to fertilize.

OVER-FERTILIZING

Using too much fertilizer may pollute surface and groundwater as rain (or over-watering) washes the soluble fertilizer off the lawn. Overuse of fertilizers causes thatch build-up (a naturally maintained lawn rarely has a thatch problem) and the reduction of earthworms and soil microorganisms. On the shoreline, over-fertilization also contributes to algae blooms and adversely affects important nearshore plants such as eelgrass because it adds excess nutrients to the ecosystem. For more information on how excess nutrients may harm Hood Canal, refer to the first section entitled Introduction to Hood Canal. For more information on the role of eelgrass in a healthy nearshore ecosystem, please refer to Guideline #10, Preserve Eelgrass Beds and Forage Fish Spawning Habitat.

Did You Know? Non-point pollution comes from many small, widespread sources such as excess pesticides and fertilizers or failed septic systems. Nitrates from fertilizers, manures and some pesticides leach through the soil and may contaminate groundwater. For more information on non-point pollution and water quality, please refer to Guideline #4, Manage Upland Water Runoff.

HELPFUL RESOURCES FOR LIMITING YOUR USE OF PESTICIDES, HERBICIDES AND FERTILIZERS

Safe disposal of pesticides and herbicides:

Jefferson County Solid Waste Division
360-385-9243
http://www.co.jefferson.wa.us/publicworks/solidwaste/default.asp

Kitsap County Solid Waste
360-337-5777
http://www.kitsapgov.com/sw/default.htm

Mason County Solid Waste
360-427-5271
http://www.co.mason.wa.us/utilities_waste/default.shtml

Alternatives to chemicals:

Northwest Coalition for Alternatives to Pesticides
541-344-5044
www.pesticide.org

The Washington Toxics Coalition
206-632-1545
www.watoxics.org

WSU Cooperative Extension, "Hortsense" website
http://pep.wsu.edu/hortsense/

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Healthy Lawn Care, Kitsap County Public Works – Solid Waste Division, available at: http://www.kitsapgov.com/sw/lawncare.htm

Bug Busters: Poison Free Pest Control for Your Home and Garden, Bernice Lifton, Square One Publishers

Ecologically Sound Lawn Care for the Pacific Northwest, Seattle Public Utilities, available at:
http://www.ci.seattle.wa.us/util/lawncare/LawnReport.htm

Or request a printed copy from: Seattle Public Utilities, Community Services Division, Resource Conservation Section, 710 Second Avenue, Suite 505, Seattle, WA 98104, 206-684-7560

For a list of additional website resources, please visit: www.hoodcanalwatershed.org

A GROUNDWATER AND SURFACE WATER PRIMER

Surface water is water that flows across or "ponds" on the ground's surface. It can result from rainfall or irrigation practices. Groundwater is simply rainfall or surface water that has infiltrated the soil.

Surface water volumes and flows can be large, especially after heavy rainfall. At such a time, you may have noticed a thin layer of water running over smooth areas such as parking lots, roofs, driveways and large expanses of lawn. This is "sheet flow," which can concentrate into small channels that enlarge rapidly. When groundwater and surface water are not properly managed, erosion and property damage can result. Typically, excessive amounts of groundwater increase problems with slope stability on bluffs by "lubricating" masses of soil that may be in unstable positions, sometimes triggering landslides.

NON-POINT POLLUTION AND WATER QUALITY

Rainwater can pick up a nasty assortment of pollutants as it flows across the land and into the Canal. This is called non-point pollution. This type of runoff can be harmful to marine plants and wildlife and make waters unhealthy for swimming. People eating fish and shellfish from the polluted waters can get sick. Some types of pollutants may eventually leave an organism's system while others remain in the body. Contaminants that remain in the body are especially problematic for predator organisms. Predator organisms consume smaller organisms that may have small amounts of contaminants in their bodies. Because these contaminants can't leave the body of the predator, they build up in a process called bioaccumulation. Over time this can lead to high levels of contaminants in top predators such as orcas, seals and eagles.

TO PREVENT POLLUTED RUNOFF:

- Retain and increase native vegetation, especially along the shoreline and/or where runoff collects or flows.
- Reduce or eliminate paved and other "hard" surfaces that produce excess runoff.
- Keep your car maintained to prevent leaks.
- Avoid storing machinery, equipment or substances outside or in areas where pollutants can leak into the ground and surface waters.
- Clean up after your pet or any livestock to prevent pollution of surface waters.
- Take your car to a commercial car wash where soapy water is recycled or wash cars and boats using a mild, phosphate-free soap, on the lawn (NOT over the septic system or drainfield and NOT on the pavement or boat ramps).

LOW IMPACT DEVELOPMENT

Low Impact Development (LID) practices can help protect water resources and the natural hydrology of watersheds. The goal is to mimic natural processes and reduce the amount of hard (impervious) surfaces and rain water runoff. These methods include using native vegetation, green roofs, rain gardens and rain barrels. Low impact development can attractively and efficiently offset some of the problems of stormwater runoff. If you decide that you would like to implement low impact development on your property, you must have your site assessed to see how stormwater is moving through the site. This assessment should include an evaluation of the site's hydrology, topography, soils, vegetation and any ponds, creeks, etc. Contact your county's planning department to arrange a site assessment.

A word of caution: If you live on a shoreline bluff, great care should be taken when collecting and redirecting runoff. Saturation of soils can lead to landslides and slope failures. Seek professional advice regarding drainage methods. For more information on stormwater and bluffs, see the web address below for the Department of Ecology's "Managing Drainage on a Bluff" website

WHEN TO AVOID LOW IMPACT DEVELOPMENT PRACTICES

Low impact development practices that infiltrate surface water into the ground are not recommended near bluffs, unstable or eroding slopes and shoreline areas, or where soils have low permeability. In these cases, remove the water by way of tightlines rather than infiltrating. A tightline is a continuous length of pipe used to transport water down a slope that is steep or susceptible to erosion. Tightlines are likely to require a permit and should not be used unless there is an existing or potential drainage-related problem on a slope. We recommend professional advice to determine the need as well as for construction.

LOW IMPACT STRATEGIES FOR YOUR PROPERTY:

- Get an expert geo-technical opinion by contacting your local planning department before infiltrating any runoff!
- When building, minimize hard (impervious) surfaces such as paved driveways, and leave as much undisturbed vegetation and soil as possible. "Traditional" site development tends to cause more rapid and concentrated runoff.
- Where soils have been disturbed, supplement with compost to increase water-absorbing capabilities. Minimize water added through lawn watering, car washing, etc. because the disturbed soils will not absorb water as effectively as native soils.
- Collect stormwater runoff through gutters and downspouts and

either tightline it to a safe location or retain it in an approved manner. The use of tightlines, rain gardens, green roofs and rain barrels might be a suitable solution for your property. Consult a geo-technical engineer or county planning staff for assistance in determining what a good option might be for your situation.

TIGHTLINES TO THE BEACH

If your groundwater and surface water are tightlined to your beach, it is very important that these lines are properly designed, constructed and maintained. The pipe that a tightline is made of has to be sufficiently strong to withstand the elements and should not be perforated. It is important to make sure that pollutants do not enter the tightline as they will be flushed directly into Hood Canal. Water from a tightline should never be discharged at the top or middle of a slope as severe erosion can occur. Also, as the flow of water discharging from these tightlines can be quite strong, especially during storms, it is very important to carefully consider and protect the discharge point. A dispersion device or method should be used at the discharge point. Again, consult the current County regulations as permits may be required. The Planning Department can provide a list of qualified engineers to design a system for you.

TIP: Inspect your tightline and its discharge frequently, especially after a major storm or earthquake. If there is a failure, severe erosion can occur over a very short period of time.

CONCERNS ABOUT EXCESS GROUNDWATER AND SURFACE WATER

Prevention or reduction of surface water runoff is often the least expensive approach to reducing drainage problems. **However, it's important to remember that drainage issues are site specific.** If you have concerns about excess groundwater or surface water on your property, contact the Planning department at the numbers listed below. For more information on site drainage issues on a bluff, please refer to Guideline #7, Develop on Bluffs with Care.

LANDSLIDES ON YOUR PROPERTY

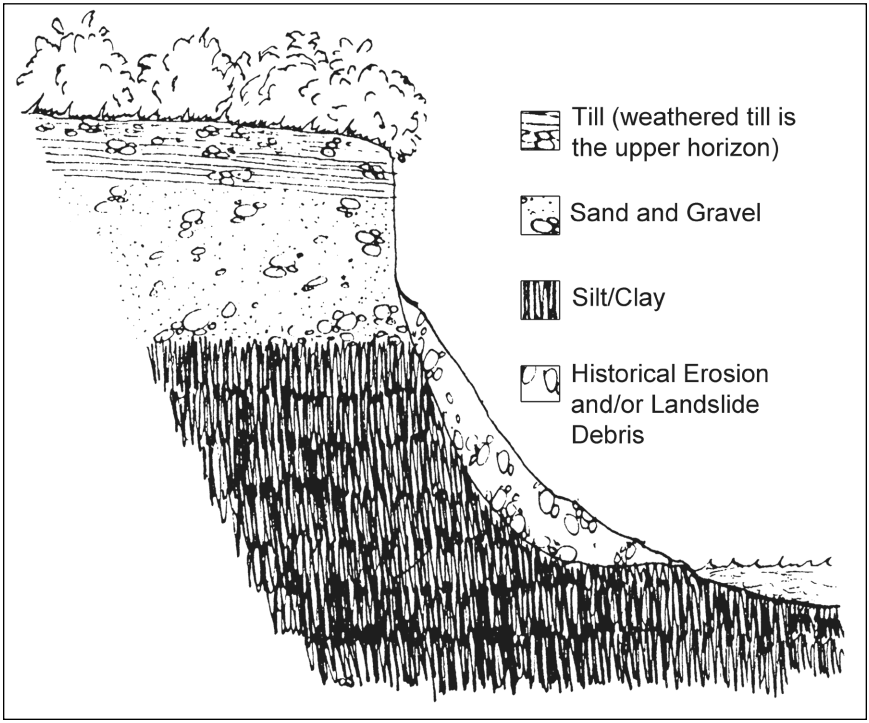
If your property is on a bluff, knowing the geology of the land is important to help you determine how best to manage the surface water and groundwater to prevent landslides. Vegetation is also a critical element that effects slope stability as fibrous roots can "knit" soils together at a bluff or on a bluff face. *For information on using native plants to control erosion on a bluff, please refer to Guideline #7, Develop on Bluffs with Care.*

With development, changes can occur in the volume and location of surface water runoff that can significantly change the potential for landslides. Hood Canal's natural geology makes some areas especially prone to landslides. The resulting combination of increased water runoff from development and naturally unstable soils can be disastrous.

Hood Canal's geology has been heavily influenced by glaciation, which has left varying soil layers. These layers include a weathered zone (including topsoil), and thick deposits of sand, gravel and glacial till (hard pan). In addition to flowing over land during heavy rains, rainfall and surface water infiltrate the soil, becoming groundwater, which often accumulates or "perches" above the glacial till or less permeable clay layers. Water that

accumulates above the impermeable layer may then flow laterally (or in a side direction) until it "daylights" as seepage on the slope face. This water can act as a soil lubricant and can cause the upper layer to slide on top of the clay layer, resulting in landslides.

ILLUSTRATION: COMMON SOIL LAYER SEQUENCE ON COASTAL SLOPES Source: Department of Ecology, Surface Water and Groundwater on Coastal Bluffs: A Guide for Puget Sound Property Owners



HELPFUL RESOURCES FOR MANAGING YOUR GROUNDWATER AND SURFACE WATER

Public Works

Jefferson County Public Works Department
360-385-9160

Kitsap County Public Works Department
360-337-5777
http://www.kitsapgov.com/pw/

Mason County Public Works Department
- Shelton: 360-427-9670 ext. 450
- Belfair: 360-275-4467 ext. 450

Planning Department

Jefferson County Community Development Department
360-379-4450

Kitsap County Planning Department
360-337-7181

Mason County Planning Department
- Shelton: 360-427-9670 ext. 352
- Belfair: 360-275-4467 ext. 352
http://www.co.mason.wa.us/community_dev/planning/default.shtml

Department of Ecology: Managing Drainage on a Coastal Bluff

http://www.ecy.wa.gov/biblio/95107.html

Puget Sound Action Team

Low Impact Development Technical Guidance Manual
http://www.psat.wa.gov/Programs/LID.htm

BIBLIOGRAPHY

Below are valuable publications available to you from the Department of Ecology with their publication numbers. You may request copies online or by mail or phone.

Department of Ecology
Publication Distribution Center 360-407-7472
http://www.ecy.wa.gov/programs/sea/shorelan.html
(Click on "Publications")

Surface Water and Groundwater on Coastal Bluffs: a Guide for Puget Sound Property Owners, #95-107

Slope Stabilization and Erosion Control Using Vegetation: A Manual of Practice for Coastal Property Owners, #93-30

Vegetation Management: A Guide for Puget Sound Bluff Property Owners, #93-31

For a list of additional website resources, please visit: www.hoodcanalwatershed.org

THE ROLE OF NATIVE PLANTS

On shorelines, native plants slow water runoff and trap pollutants. Keeping one's property as "natural" as possible has many advantages. Native trees, shrubs and plants capture large quantities of water during rainstorms, thereby helping reduce potentially damaging runoff and landslides. *For information on using native plants to control erosion on a bluff, please refer to Guideline #7, Develop on Bluffs with Care.*

ADVANTAGES OF USING NATIVE PLANTS IN YOUR LANDSCAPE

- Native plants are well adapted to our climate and deal successfully with insects and diseases.
- Native plants seldom require fertilizers or pesticides.
- Once established, native plants generally require no watering.
- Wildlife is adapted to native plants and dependent on them for food, cover and breeding places.

OVERHANGING AND FALLEN TREES

Trees that overhang the beach or have fallen downward onto the beach protect embankments from wave action and thus help in soil retention, as well as provide vitally important shade, shelter and insect food for fish and other marine life. Some downed nearshore trees may live for a number of years. Leave them if you can. If you need to, prune fallen trees instead of removing them. *For more information on the importance of shade trees to forage fish, refer to Guideline #10, Preserve Eelgrass Beds and Forage Fish Spawning Habitat.*

PRUNE FOR VIEWS

Trees are vital to the good health of shoreline properties and

should be cut only when they are a hazard. To make the most of your waterfront panorama, frame views by selectively pruning your trees rather than cutting them down.

RECOMMENDED PRUNING STRATEGIES

ILLUSTRATION: WINDOWING, THINNING, LIMBING UP Source: Department of Ecology, Vegetation Management: A Guide for Puget Sound Bluff Property Owners

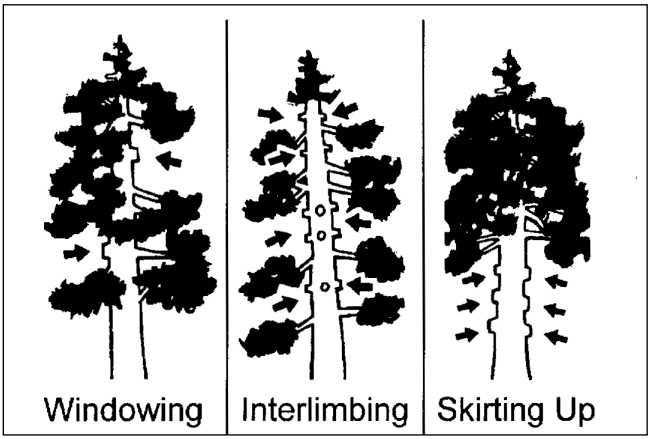
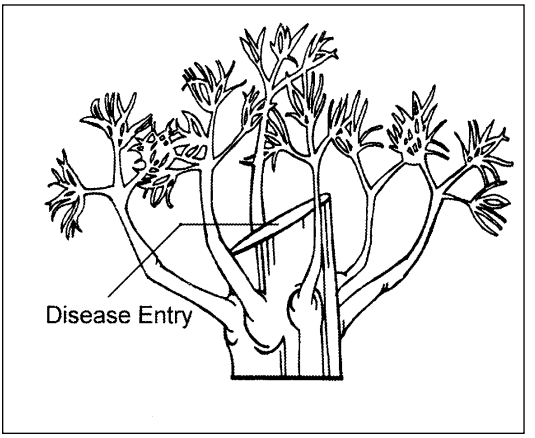


ILLUSTRATION: A "TOPPED" TREE Source: Department of Ecology, Vegetation Management: A Guide for Puget Sound Bluff Property Owners



NEVER TOP A TREE!

Topping can lead to disease and death of the tree. It may also lead to re-growth of weak upper limbs which may cause dangerous downed limbs in heavy wind.

KEEP YARD WASTE OFF BLUFFS AND BEACHES

Yard waste kills underlying vegetation, adds dead weight (usually wet and soggy) to the upper portion of a slope and can easily slide, possibly precipitating a larger slide or doing down-slope damage. The discarded plant material may be washed away by tidal action. Although out of sight, the breakdown of plant material consumes the limited amounts of dissolved oxygen in Hood Canal, oxygen that marine animals need.

By definition under statewide Solid Waste Regulations, yard waste and grass clippings are considered solid waste and therefore must be handled and disposed of properly. It is unlawful to dispose of any type of solid waste by dumping it on the ground, into the water or burying it. Solid waste may be dumped and buried at a permitted landfill or in some neighborhoods, collected by yard waste collection companies.

TWO ALTERNATIVES TO DUMPING:

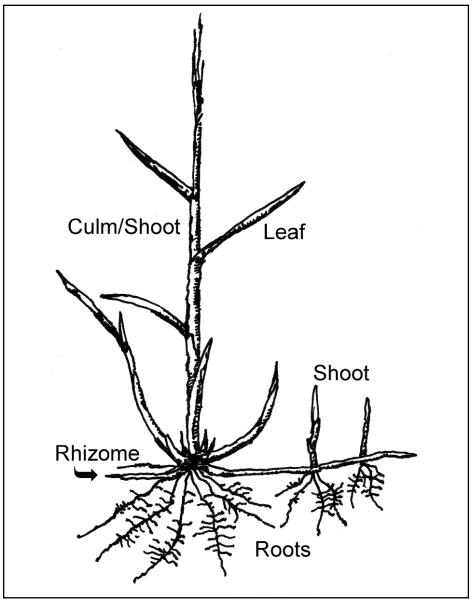
1. Compost yard waste. Composted material is beneficial to gardens because it increases soil fertility and microorganisms. To prevent composted material from entering Hood Canal, use an above-ground compost bin if possible and position it well away from the water's edge.

2. Leave lawn clippings on the lawn. Grass clippings help keep your lawn green by recycling nitrogen.

SPARTINA IS A NASTY NOXIOUS WEED

At first glance, *Spartina* appears to be just grass growing in or along the water. But look closer and you'll see that it severely disrupts the native saltwater ecosystem, alters fish, shellfish and bird habitat, and increases the threat of floods. *Spartina* colonizes in areas that would normally be mudflats, changing the natural regime of soil erosion and deposition by trapping soil with its roots.

Illustration of a *Spartina* plant



This is a non-native, invasive weed that can rapidly 'take over' whole beach areas just like weeds can take over our yards and gardens.

Early control of an infestation is essential. Care must be taken to remove not only the visible plant but all roots or rhizomes. Those removed must then be disposed of far from the shore, preferably in a landfill to prevent re-sprouting. Do not compost *Spartina*! When established, *Spartina* is far more difficult to eradicate. All *Spartina* invasions should be reported to the local Noxious Weed Control Board. Before pulling out a suspected bed of *Spartina*, carefully clip a couple of small stalks, placing them in a plastic bag as you collect them on the beach for identification by your local weed board. There are many beach grasses that look alike.

HOW TO IDENTIFY *SPARTINA*

Spartina appears as individual plants, small clumps, or when established, as large circular masses of plants several feet tall in the intertidal zone. Its stems are round and hollow with leaves spreading out from the stem at nearly right angles. At the base of the leaves there is a row if fine hairs.

Sprouting in the spring, *Spartina* flowers and seeds from mid-summer to fall. The seed heads top the long stalks that grow

straight up from the plant. *Spartina* turns brown in the fall and generally remains dormant until early spring.

KNOWN *SPARTINA* INFESTATIONS IN HOOD CANAL

All these *Spartina* infestations have been treated and are being monitored.

- Dosewalips State Park
- Thorndyke Bay
- Tarboo Bay
- Bywater Bay

HELPFUL RESOURCES FOR ENCOURAGING NATIVE PLANTS AND TREES

Gardening with native plants:

WSU Master Gardener Stewardship Gardening Website:
http://gardening.wsu.edu/stewardship/

Jefferson County Master Gardeners
http://jefferson.wsu.edu/jefferson/MasterGardeners/index.shtml

Kitsap County Master
Gardenershttp://kitsap.wsu.edu/hort/mg_volunteer_info.htm

Mason County Master Gardeners
http://mason.wsu.edu/MG/index.html

Grow Your Own Native Landscape: A Guide to Identifying, Propagating and Landscaping with Western Washington Native Plants. WSU Publication Misc 0273
http://gardening.wsu.edu/text/nwnative.htm

Native plant sales:

Washington Native Plant Society
888-288-8022
http://www.wnps.org

Pacific Northwest Native Wildlife Gardening
http://www.tardigrade.org/natives/nurseries.html

To dispose of yard waste:

Jefferson County
Murrey's Olympic Disposal 360-452-7278 or 800-422-7854
or Waste Connections Inc. at 385-6612
http://www.co.jefferson.wa.us/publicworks/solidwaste/default.asp

Kitsap County
Waste Management 800-592-9995
http://www.kitsapgov.com/sw/ (Click on the link for "Curbside garbage and recycling" or "Drop-off garbage and recycling".

Mason County
Waste Management also know as Mason County Garbage 360-426-8729

To report illegal dumping:

Jefferson County Environmental Health Department
360-385-9444

Kitsap Public Works
360-337-7121

Mason County Environmental health
360-427-9670 ext. 361 or 584

Composting

Jefferson County
360-385.9160
http://www.co.jefferson.wa.us/publicworks/solidwaste/compost.asp

Kitsap County Public Works
360-337-7121
Mason County
360-432 5126

To report *Spartina* invasions and other noxious weeds:

Jefferson Noxious Weed Control Board
360-379-5610 ext. 205
http://www.co.jefferson.wa.us/WeedBoard/Default.asp

Kitsap Noxious Weed Control Board
360-337-7157
http://kitsap.wsu.edu/enviro/nox_weed_edu.htm

Mason Noxious Weed Control Board
360-427-9670 ext. 395
http://mason.wsu.edu/Weeds/

Related Links

Managing Vegetation on Coastal Slopes, Department of Ecology. Vegetation management during site development to reduce the hazard of erosion and landslides.
http://www.ecy.wa.gov/programs/sea/pubs/93-31/intro.html

Controlling Erosion Using Vegetation, Department of Ecology. An online guide to controlling erosion on slopes and bluffs using vegetation.
http://www.ecy.wa.gov/programs/sea/pubs/93-30/intro.html

Spartina Identification
www.wsg.washington.edu

BIBLIOGRAPHY

Gardening with Native Plants of the Pacific Northwest, Arthur Kruckeberg, University of Washington Press

Native Plants in the Coastal Garden, April Pettinger, Whitecap Books

Plants of the Pacific Northwest Coast, Jim Pojar and Andy McKinnon, Lone Pine Publishing

Landscaping for Wildlife in the Pacific Northwest, Russell Link, University of Washington Press

2000 Spartina Management Plan for Hood Canal, Washington State Department of Agriculture available at: http://www.willapabay.org/~coastal/nospartina/control_program/mgmtplans/2000HoodCanalMgmtPlan.pdf

Below is a valuable publication available to you from the Department of Ecology with a publication number. You may request a copy online or by mail or phone.

Department of Ecology
Publication Distribution Center
360-407-7472
http://www.ecy.wa.gov/programs/sea/shorelan.html
(Click on "Publications/Forms")

Vegetation Management: A Guide for Puget Sound Bluff Property Owners, #93-31

For a list of additional website resources, please visit: www.hoodcanalwatershed.org

GUIDELINE 6

KNOW THE PERMIT PROCEDURES FOR SHORELINE DEVELOPMENT

WHY YOU NEED A PERMIT TO DEVELOP YOUR SHORELINE

Shoreline resources are finite and must be effectively managed if their many values are to be preserved. Planning under Washington State's Growth Management Act provides a unique opportunity to consider shorelines and their relationship to the community as a whole and its overall development strategy.

THE SHORELINE MANAGEMENT ACT (SMA)

In 1971, the Washington State Legislature passed the Shoreline Management Act. This act was validated by voters in the November, 1972 election.

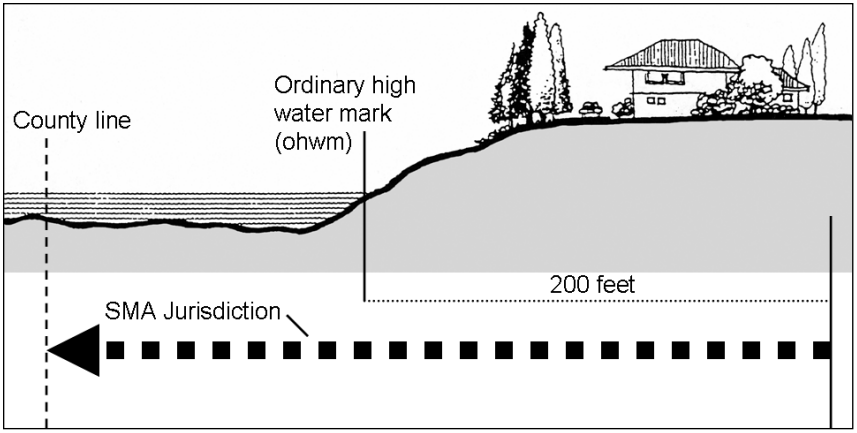
OBJECTIVES OF SMA

- To protect and preserve shoreline resources.
- To provide for reasonable use of the state's shorelines.
- To preserve the public's right to access the shorelines.

The Shoreline Management Act covers more than 20,000 miles of Washington State saltwater, river and lake shorelines. This includes more than 2,600 miles of saltwater shoreline. Hood Canal has 215 miles of shoreline, 32% of which is lined by bulkheads or other hard structures.

Did you know? Anchor buoys in the middle of a bay are covered by SMA permitting processes. Why? Because the SMA jurisdiction includes the water to the middle of the Canal, or wherever the county across the water intersects.

ILLUSTRATION: SMA COVERAGE Source: Department of Ecology, Shoreline Master Program Handbook



The Shoreline Management Act along marine shorelines applies to the area from 200 feet landward of the "ordinary high water mark" extending offshore to the county line.

SHORELINE MASTER PROGRAMS

The provisions of the Shoreline Management Act established a planning and regulatory program, which is initiated at the local level under state guidance. This cooperative effort balances local and statewide interests in the management and development of shoreline areas by requiring local governments to plan (via shoreline master programs, or SMPs) and regulate (via permits) shoreline development.

In Jefferson, Kitsap and Mason Counties, compliance with SMP is monitored by each county's Planning Department and the Department of Ecology. Each county works with Ecology to coordinate with the State Departments of Fish and Wildlife and Natural Resources and the US Army Corps of Engineers. The Department of Natural Resources may be a participant where state-owned tidelands and bedlands are involved.

THE SHORELINE PERMIT PROCESS

All permits for development on your shoreline property originate at the local level. Substantial development permits for work such as clearing, grading and construction are approved locally. Some conditional use permits and variances are locally approved and then sent to the Department of Ecology for their approval. Appeals to denied permits are made through the local hearing examiner and the state shorelines hearing board.

Some minor types of shoreline development may be "exempt" from permit requirements. They must still be reviewed by your local Planning Department for consistency with the Shoreline Master Program and the Shoreline Management Act.

DEVELOPMENT REQUIRING A PERMIT

Major saltwater activities requiring a permit include:

- Bulkheads
- Filling
- Boat launches
- Piers
- Dry docks
- Artificial reefs
- Dock floats
- Marinas
- Placement of utility lines
- Pile driving
- Dredging

The above are only examples of major types of activities. Any construction activity below the ordinary high water line requires a permit, even if the activity is outside the water at the time it is undertaken.

In some cases, a Department of Fish and Wildlife Area Habitat Biologist will visit the project site. They will work with you to help achieve your objective while protecting fish, shellfish and their habitat.

COMPLIANCE WITH SHORELINE REGULATIONS

You play a vital role in shoreline administration through peer education and bringing shoreline issues to the attention of state

and local personnel. With ever-increasing work loads and reduced funding of staff positions, local and state agencies must rely more and more on citizen help in protecting and preserving our shoreline resources and letting local officials know how they feel about shoreline issues.

HELPFUL RESOURCES FOR UNDERSTANDING THE PERMIT PROCEDURES FOR SHORELINE DEVELOPMENT

Planning Department

Jefferson County Community Development Department
360-379-4450

Kitsap County Planning Department
360-337-7181

Mason County Planning Department
- Shelton: 360-427-9670 ext. 352
- Belfair: 360-274-4467 ext. 352
http://www.co.mason.wa.us/community_dev/planning/default.shtml

Department of Ecology

Ecology maintains oversight of the Jefferson, Kitsap and Mason county Shoreline Master Programs and the shoreline permit processes. They also maintain a large and informative website.

Puget Sound: http://www.ecy.wa.gov/programs/sea/pugetsound/
Shoreline aerial photos: http://www.ecy.wa.gov/apps/shorephotos/
Landslides: http://www.ecy.wa.gov/programs/sea/landslides
Permit Assistance Center: 360-407-7037

BIBLIOGRAPHY

Below are valuable publications available to you from the Department of Ecology with their publication numbers. You may request copies online or by mail or phone.

Department of Ecology
Publication Distribution Center
360-407-7472
http://www.ecy.wa.gov/programs/sea/shorelan.html
(Click on "Publications/Forms")

Washington State Permit Assistance Center, #00-06-041

Introduction to Ecology's New Shoreline Master Program Guidelines,
#01-06-04

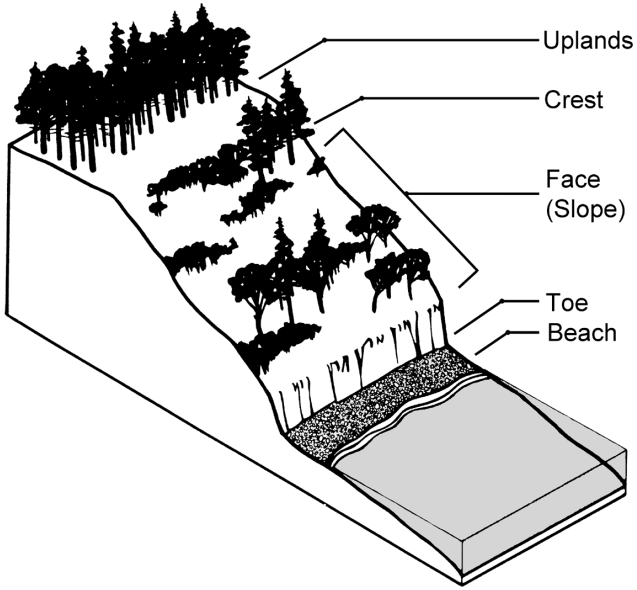
Working in the Water, #99-06
Shoreline Master Program Handbook, #93-104C

For a list of additional website resources, please visit: www.hoodcanalwatershed.org

The coastal bluffs of the Hood Canal region result from thousands of years of erosion and are an important natural feature of the Puget Sound's shoreline.

Many of Hood Canal's bluffs and beaches "feed" sediments to adjacent beaches and nearby "accretion" beaches, which are typically either low spits of land that jut into the intertidal zone or coves between headlands. When seawalls or bulkheads are placed on beaches with feeder bluffs, the natural process is halted. Without continual replenishment, beaches and accretion beaches erode, threatening homes and wildlife populations. Ironically, bulkheading of bluffs to protect property often leads to the loss of adjacent beaches and increased erosion of neighboring bluffs.

ILLUSTRATION: ANATOMY OF A BLUFF Source: Department of Ecology, ***Vegetation Management: A Guide for Puget Sound Bluff Property Owners***

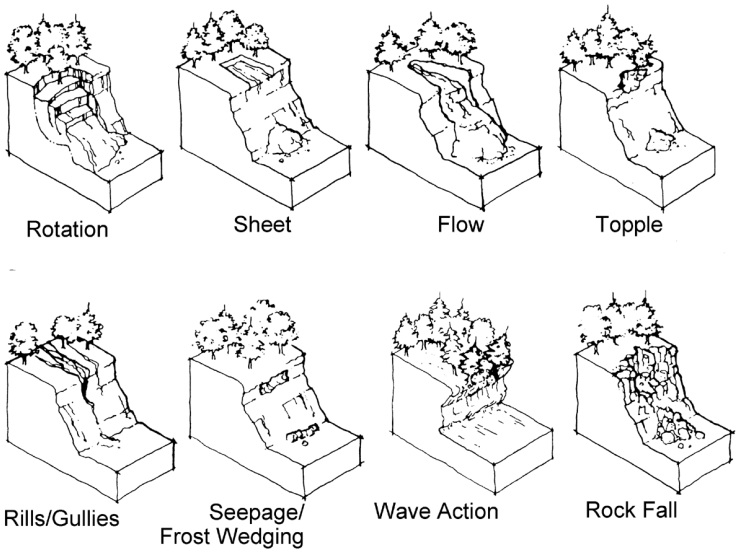


YOUR ACTIONS IMPACT BLUFF EROSION

Property owners often unknowingly increase bluff erosion. Clearing vegetation, disturbing the soils, poor site drainage and modifications to the bluff for access can all lead to landslides and accelerated erosion. Improper clearing of vegetation can also lead to increased danger from tree falls and wind damage.

Did you know? Bluff erosion is often characterized by decades of gradual change, punctuated by sudden landslides. Slides can undermine structures at the top of the bluff or bury structures at the bottom.

ILLUSTRATION: TYPES OF BLUFF EROSION Source: Department of Ecology, Vegetation Management: *A Guide for Puget Sound Bluff Property Owners*



LEAVE STUMPS IN PLACE

Please keep in mind that it is best to save all stumps near a shoreline bluff or slope. Their roots alone will help stabilize soil. Likewise the removal of invasive plants such as Himalayan blackberry or Scotch broom from unstable shore property is unwise without an immediate revegetation plan.

NATIVE PLANTS HELP CONTROL EROSION

Bluff shoreline property owners have yet other considerations. Excessive erosion must be contained. If not, the particles slipping down onto the beaches and into the water can cover and smother many marine plants and animals. Hence, "buffer zones" of trees, shrubs and plants along bluffs are a must. If you choose to plant trees on a slope then you should plant bareroot stock. This allows you to minimize the amount of soil that you disturb in order to plant and in the long term bareroot stock will be more successful. You should also mulch heavily around the planting to help retain moisture and prevent erosion.

Did you know? English ivy is not a good erosion control option. It is invasive and will smother native plants. It is considered a noxious weed by the state and should not be planted. It is also not an effective soil holder and will just hide the signs of slope instability.

GOOD CHOICES FOR STABILIZING THE SOIL AND EROSION CONTROL:

Trees:
Douglas fir
Bigleaf maple
Madrone
Red cedar
Willow

Shrubs:
Ocean spray
Salal
Snowberry
Vine maple
Serviceberry

For more information on the role of native plants in shoreline landscapes, please refer to Guideline #5, Encourage Native Plants and Trees.

WAYS TO LIMIT BLUFF EROSION

- View local setback requirements (100 feet) as an absolute minimum. For new construction, locate your home sufficiently far from the water or bluff so it is not susceptible to wave damage, erosion or landslides. Resist the urge to trade off safety for the sake of a slightly improved view. When developing your site, do so with a minimum of disturbance. Leave as much native vegetation as possible, including an undisturbed vegetation buffer along the top of the bluff.
- Where practical, replant bare areas. Use hardy, deep-rooted native species appropriate to the site (except near septic tank and drainfields). Avoid landscaping that requires watering. Instead of removing or topping trees, selectively thin or window them to improve views. This action also promotes root vigor. Refer to section #5, Encourage Native Plants and Trees, for an illustration of thinning and windowing trees.
- Divert runoff away from the bluff face. Excessive groundwater and surface water runoff are leading causes of landslides and bluff erosion. Coordinate with neighbors to avoid concentrating runoff if possible. For more information on this topic, please refer to section #4, Manage Your Upland Water Runoff.
- Plan beach access carefully for minimal soil and vegetation disturbance. Where possible, consider sharing access with neighbors to minimize disturbance and costs. Consider building a "hybrid" system (a combination of trail, ladder, winding paths and stairs) to limit disturbance on the bluff.

- Avoid building bulkheads or other erosion control structures. Increased wave activity in front of and to the sides of a bulkhead encourage unnecessary erosion, often to your neighbor's property. For more information on the effects of bulkheading, please refer to section #8, Minimize Bulkheads.
- Do not dump yard waste over the edge of your bluff. It sets the stage for future erosion because these piles of green waste smother native plants holding fragile slopes in place. Even small heaps of grass clippings can take years to break down, robbing valuable oxygen from Hood Canal's marine life.

HELPFUL RESOURCES FOR DEVELOPING ON BLUFFS WITH CARE

Planning Department

Jefferson County Community Development Department
360-379-4450

Kitsap County Planning Department
360-337-7181

Mason County Planning Department
- Shelton: 360-427-9670 ext. 352
- Belfair: 360-275-4467 ext. 352
http://www.co.mason.wa.us/community_dev/planning/default.shtml

Native Plants

Native Plant Salvage Project Guide:
http://gardening.wsu.edu/NWnative/

BIBLIOGRAPHY

Living with the Shore of Puget Sound and the Georgia Straight, Thomas A. Terich, Duke University Press

The Coast of Puget Sound—Its Processes and Development, John Downing, University of Washington Press

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Vegetation Management: A Guide for Puget Sound Bluff Property Owners, #93-31

Surface Water and Groundwater on Coastal Bluffs: A Guide for Puget Sound Property Owners, #95-107

Bluff Erosion Monitoring on Puget Sound: A Guide for Volunteers,
#00-06-022

For a list of additional website resources, please visit: www.hoodcanalwatershed.org

GUIDELINE 8

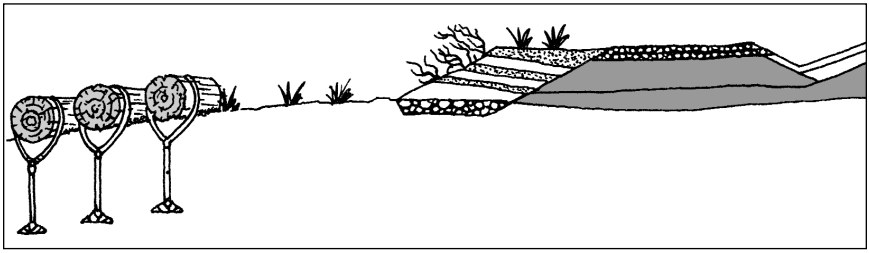
USE SOFT ARMORING TECHNIQUES WHEN APPROPRIATE

As discussed in *Guideline 7*, shoreline bluffs and beaches are dynamic environments where erosion and storms are the rule rather than the exception. It's important to understand the process of the beach we live on and act accordingly to protect shoreline property. The shoreline actually depends on continuing erosion to maintain beaches and to support nearshore and intertidal habitats, yet development is often intolerant of even relatively gradual erosion. While some landowners don't need any structures to stabilize their property, others often go to great expense to engineer rock, wood and concrete structures to stabilize eroding property. This is called shoreline hardening, or bulkheading. Fortunately for some properties, there are other ways to protect your land while letting the necessary movement of beaches to occur.

SOFT EROSION CONTROL

Soft-shore protection projects rebuild the high-tide beach to provide protection of property and homes and increase coastal sediment supply. This approach uses indigenous materials such as gravel, sand, logs and root masses to absorb wave energy.

ILLUSTRATION: EXAMPLE OF A LOW-ENERGY ZONE SOFT-SHORE PROTECTION PROJECT Source: Department of Ecology, Alternative Bank Protection Methods for Puget Sound Shorelines



Anchoring logs on the beach helps dissipate wave energy and may help increase the deposition of sediment on the beach.

Here are some reasons to use soft erosion control to protect your property instead of hard armoring techniques (bulkheads).

THE IMPACT OF BULKHEADS

Bulkheads cut off the sediments supplied to the beach by erosion. This leads to sediment-starved conditions that can actually increase erosion and alter beach composition. The cumulative effect of numerous bulkheads along a reach of shoreline may be the long-term, irreversible loss of habitat and increased erosion on the property of others.

Did you know? In the southern end of Hood Canal, 66% of the north shore and 70% of the south shore is altered by bulkheads or some other kind of non-natural structures.

OTHER SIDE EFFECTS OF BULKHEADS:

- Hard structures, especially when vertical, reflect wave energy back onto the beach, modifying the energy regime on the beach and frequently undermining the bulkhead.
- Increased wave energy and loss of sediment supplies can lead to coarsening of the beach as sand and small gravel are progressively winnowed from the beach. The result is a shift to coarser gravel and cobble beaches and more frequent exposure of underlying hardpan or bedrock.
- Installation of bulkheads often requires that upland vegetation be removed and can prevent mature native vegetation from becoming re-established.
- Bulkheads can decrease availability of spawning areas for forage fish.

Did you know? It is natural for our beaches to erode and long-term erosion rates are generally quite slow. The rates vary from one site to the next but an average range is one foot per decade (0.1 foot/year), often reflecting the loss of several feet of bluff or bank in a landslide every twenty or thirty years.

WHAT CAN YOU DO?

There are a number of actions that you can take to help prevent erosion on your beach. Some actions require a minimum of money and effort while others may require more work and investment.

HAVE YOUR SITE PROFESSIONALLY ASSESSED FOR SOFT ARMORING SUITABILITY

Soft-shore protection designs are not suitable for all sites. The erosion rate, the type and causes of erosion and an evaluation of wave energy are critical for determining whether a soft-shore protection strategy will work on a particular beach. If you're interested, please contact the Planning Department for a list of coastal geologists who design soft-shore protection systems.

RETAIN DRIFTWOOD AND NATIVE VEGETATION

The presence of driftwood and other large woody debris helps to retain sediments and absorb wave energy. If you find them washed up on your beach, leave them in place. Also, intertidal plants, dune grass and other berm vegetation can greatly increase the resilience of beaches to storm waves. Native vegetation on shorelines and bluffs are your best first line of defense against erosion.

IF YOU MUST REPLACE OR BUILD A BULKHEAD

If it's necessary for you to have a bulkhead, build it to recognized standards. Construct it as far away from the water's edge as

possible and build only as much structure as necessary. (A 200' bulkhead is not necessary to protect the base of a stairway.) Consult the Planning department for assistance with design and permits. Plant a wide native plant buffer along your bulkhead to provide food and habitat for wildlife and increase erosion protection.

HELPFUL RESOURCES FOR MINIMIZING BULKHEADS

Planning Department

Jefferson County Community Development Department
360-379-4450

Kitsap County Planning Department
360-337-7181

Mason County Planning Department
- Shelton: 360-427-9670 ext. 352
- Belfair: 360-275-4467 ext. 352
http://www.co.mason.wa.us/community_dev/planning/default.shtml

The Planning department can advise on geologists with soft-shore protection expertise.

BIBLIOGRAPHY

Below is a DOE publication available to you with its publication number. You may request a copy online or by mail or phone.

Department of Ecology
Publication Distribution Center
360-407-7472
http://www.ecy.wa.gov/programs/sea/shorelan.html
(Click on "Publications/Forms")

Alternative Bank Protection Methods for Puget Sound Shorelines, #00-06-012

For a list of additional website resources, please visit: www.hoodcanalwatershed.org

GUIDELINE 9

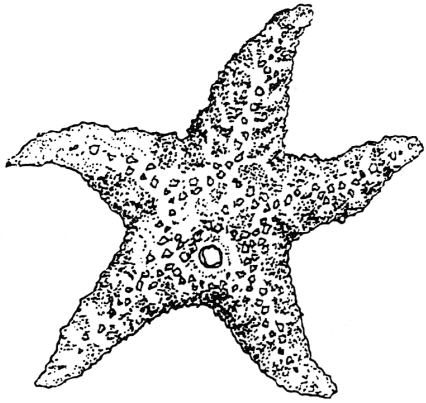
RESPECT INTERTIDAL LIFE WHILE ON THE BEACH AND BOATING

COMMON BEACH SENSE

Beach etiquette is an important issue. Investigate, learn, have fun and leave the beach cleaner than you found it while respecting the intertidal species who make their homes on the beach and rocky shore.

A FEW THINGS TO KEEP IN MIND AS YOU EXPLORE

- Walk around tidepools and barnacle covered rocks (barnacles are living animals).
- Enjoy sea creatures by looking at them, but do not handle or touch them.
- Look carefully under rocks and seaweed and replace the rocks exactly the way you find them. Organisms live underneath rocks and seaweed to protect themselves from air, sun, and from being eaten by their predators. If you leave them uncovered, you destroy their home and possibly them too.

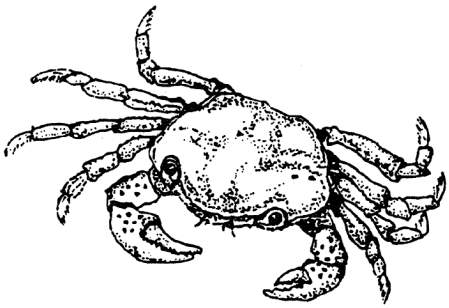


- Leave all vegetation where you find it. Plants prevent erosion, are food for animals and insects, and add variety and beauty to the beach.
- Refill holes you dig in the sand. Leftover piles of sand may suffocate other marine life.
- Respect the birds and mammals that you see on the beach. Give them plenty of space to go about their business. They are probably eating, and nobody wants to be disturbed at mealtime.

BOATING ON INTERTIDAL WATERS

Boating in any type of craft should be done in a safe and conscientious manner. Using common sense will limit further damage to salmon and forage fish habitats. *For more information on these habitats, please refer to Guideline #10, Preserve Eelgrass Beds and Forage Fish Spawning Habitats*.

AVOIDING DAMAGE TO THE ENVIRONMENT WHILE BOATING

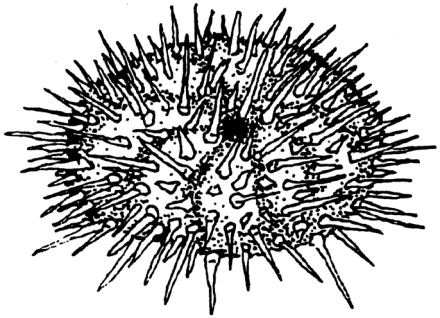


- When boating, slow to a wakeless speed within 300 feet of the shoreline. This prevents excessive erosion and respects forage fish and salmon habitat.
- Inspect your boat's motor regularly and make sure that it isn't leaking fuel into the water. Consider purchasing a motor that meets or betters EPA 2006 guidelines.
- When refueling, make sure hoses are tightly connected and that no gas spills into the water. Use an "oil absorb" pad to catch fueling drips and spills.
- Do not pump any sewage or waste material into the water. Use only designated State pumpout locations (see below for contact information.)
- Avoid dragging your anchor. It may damage clam, oyster and eelgrass beds.
- Personal Watercrafts (PWC) disturb fragile intertidal areas when used irresponsibly. Do not operate them in shallow water (less

than 24 inches deep), avoid creating a wake, which causes erosion to the shoreline, and do not dock in reeds and grasses.

- If you encounter whales while boating: avoid getting closer than 100 yards from a whale, do not separate mothers and calves and limit your observation of the whales to 30 minutes. For more guidelines on encounters with whales while boating see *Soundwatch Boater Guidelines: Best Practices for Viewing Marine Wildlife*.

FIRES ON THE BEACH



Beach fires can be a great part of going to the beach. However driftwood fires are a genuine concern to firefighters and local residents on neighboring uplands. Because of these dangers, beach fires should only be built under strictly controlled circumstances. Fires could ignite tree roots and dry grasses. Bring your own wood and do not burn driftwood off the beach, as this is part of the habitat structure. Fires should be made above the ordinary high water mark in order to minimize the damage to organisms that make their home on the beach.

Check with your city and county on the legality of beach fires. In some areas they are illegal. **Do not build a beach fire when a burn ban is in effect.**

USUALLY A CAMPFIRE OR BONFIRE IS LEGAL WITHOUT A BURNING PERMIT IF:

- The fire is at least 50 feet from any structure.
- The fire is less than 3 feet in diameter and 2 feet high.

- You have a shovel nearby.
- There is always somebody present to tend the fire.
- The surrounding area is free of flammable materials.
- You douse a fire completely with water prior to leaving the site.

MARINE MAMMALS ON THE BEACH

Marine mammals may occasionally use the beach for various reasons. Adult seals and sea lions often rest on the shoreline or go there to avoid visiting Orcas, but they will eventually return to the water. Mother seals may leave their pups on the shore while they go find food. If you see a seal pup alone, it may not necessarily be abandoned. Should you find a seal pup that appears to be in distress, contact the National Marine Fisheries Services immediately at 800-853-1964.

If whales, dolphins or otters appear to be stranded on the beach, it's imperative that you report it to the Marine Mammal Stranding Network. ***Never*** attempt to touch a marine mammal, especially one that is stranded and do not allow pets near the animal. Wild animals in a stressed condition bite, and they often carry diseases that are harmful to humans and dogs.

TO REPORT A STRANDING

1. Note the condition and location of the animal (without getting too close).
2. Do not touch, disturb, feed or pour water on the animal.
3. Contact National Marine Fisheries Services immediately at 206-526-6733.

HELPFUL RESOURCES FOR RESPECTING INTERTIDAL LIFE

National Marine Fisheries Service Enforcement Hotline:
800-853-1964

Washington State Pump out locations:
State Parks Commission
360-902-8500
http://www.parks.wa.gov

Boating safety:
U.S. Coast Guard
800-368-5647

Adventures in Boating – Washington – Handbook. Available for free download at:
http://www.boatwashington.org/washington_boaters_guide_request.htm

Soundwatch Boater Guidelines: Best Practices for Viewing Marine Wildlife, Available for free download at:
http://www.whale-museum.org/downloads/soundwatch/SWguidelines_02.pdf

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Seashore Life of the Northern Pacific Coast, Eugene N. Kozloff, University of Washington Press

The Natural History of Puget Sound Country, Arthur Kruckeberg, University of Washington Press

Pacific Coast—Audubon Nature Guide, McConnaughey and McConnaughey, Alfred A. Knopf Inc.

The Beachcomber's Guide to Seashore Life in the Pacific Northwest, J. Duane Sept, Harbour Publishing

Seashore of the Pacific Northwest, Ian Sheldon, Lone Pine Publishing

Marine Wildlife of the Puget Sound, San Juans and the Strait of Georgia, Steve Yates, Sasquatch Books

For a list of additional website resources, please visit: www.hoodcanalwatershed.org

PRESERVE EELGRASS BEDS AND FORAGE FISH SPAWING HABITATS

EELGRASS PROVIDES A DIVERSE HABITAT

Eelgrass is technically a true grass not seaweed. It is a flowering, perennial plant that grows both by vegetative growth and by seed germination. Eelgrass needs adequate sunlight and water clarity to grow. In the Northwest, the maximum depth is about 22 feet. Structures such as docks can prevent eelgrass from getting enough light to grow. The Washington Department of Ecology estimates that 33% of the eelgrass beds in Washington have been lost to development.

ILLUSTRATION: THE EELGRASS MEADOW Source: Reproduction of Port Townsend Marine Science Center's Eelgrass interpretive display

EELGRASS FACTS:

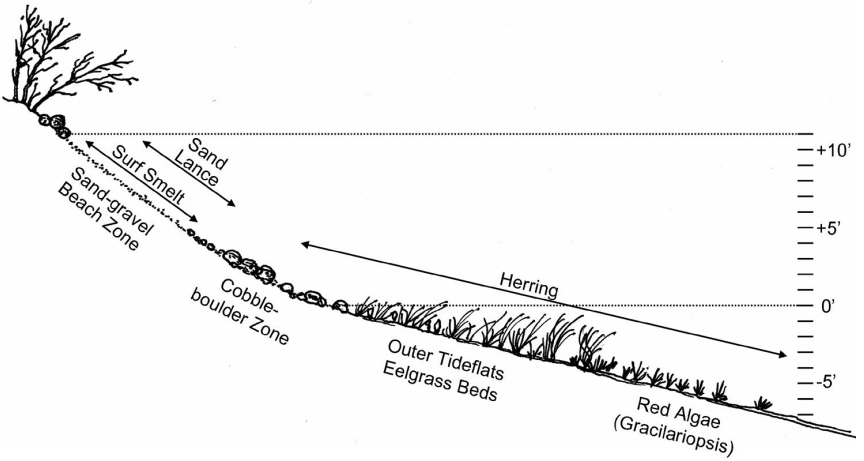
- Softens the impact of waves and currents.
- Stabilizes the shoreline, providing a calm space where organic matter and sediments are deposited.
- Provides a diverse habitat for many species, as well as protection from predators for many juvenile fish, including salmon.
- Shelters small animals and plants from extreme temperatures during
  low tides.
- Decomposes into an important part of the food web for the coastal
  marine ecosystem.
- Grows in the spring and summer then decays in the fall and winter.
- Grows blades up to 3 feet in length
- Is often used by Dungeness crabs in spring when molting.
- Is a substrate for herring eggs and a hiding place for juveniles.
- Is a resting and feeding place for salmon before and after traveling rivers.

FORAGE FISH ARE INDICATOR SPECIES

The more common forage fish species within Hood Canal include, Pacific herring, surf smelt and Pacific sand lance (also known as candle fish). Forage fish are an important and abundant fish species in Washington. As the name implies, the significance of forage fish is related to the critical role they play as a food source for a large variety of other marine organisms, including salmon. The spawning grounds for all three of the most common Puget Sound forage fish are along the shoreline and therefore, vulnerable to shoreline development.

The vitality of the total forage fish resources in Washington is a valuable indicator of the overall health and productivity of our marine environment.

ILLUSTRATION: FORAGE FISH SPAWNING HABITAT ZONE OF SARATOGA PASSAGE and PORT SUSAN Source: Dan Penttila, Department of Fish and Wildlife



PACIFIC HERRING FACTS:

- Herring eggs may be deposited on eelgrass or seagrass that appears anywhere between the upper limits of high tide to a depth of -40 feet, but most spawning takes place between 0 and -10 feet in tidal elevation.
- Herring stocks spawn from late January through early April.
- Natural mortality for herring is quite high with approximately 50 to 70 percent of the adult herring from Washington falling to predation each year.
- Each herring spawning ground is assumed to represent a distinct stock.

SURF SMELT FACTS:

- Surf smelt spawn in beach coarse sand and pea gravel.
- Surf smelt eggs are deposited near the water's edge around the time of high slack water at a tidal elevation between +7.0 and mean high-high water line.

Did You Know? Overhanging shade trees along the beach are vital to the survival of surf smelt eggs during the summer months. To encourage surf smelt spawning it is wise to preserve existing trees and/or re-forest sections of the shoreline where the marine forest has been removed during the course of development.

PACIFIC SAND LANCE (CANDLE FISH) FACTS:

- **60% of a juvenile Chinook salmon's diet is sand lance.**
- Sand lance deposit eggs on a rather broad range of beach substrates, from fine sand beaches to gravel beaches up to 3cm in diameter.
- Sand lance spawning occurs at tidal elevations ranging from +5 feet to about mean higher high water line.
- Sand lance feed in open water during the day and burrow into the sand at night to avoid predation.
- Sand lance are an important part of the nutritional link between zooplankton and larger predators in the local marine food webs.

HELPFUL RESOURCES FOR PRESERVING EELGRASS BEDS AND FORAGE FISH SPAWNING HABITATS

Washington Department of Fish and Wildlife Forage Fish webpage http://wdfw.wa.gov/fish/forage/forage.htm

Washington Department of Ecology Eelgrass webpage
http://www.ecy.wa.gov/programs/sea/pugetsound/species/eelgrass.html

If you would like to know if you have documented forage fish spawning habitat, please contact the Beach Watchers.

Jefferson County Marine Resources Committee
http://jefferson.wsu.edu/mrc/

Eelgrass harvesting licenses
360-902-1100

For a list of additional website resources, please visit:
www.hoodcanalwatershed.org

Washington State University Jefferson County Extension: 360-379-5610 x 204	Washington State University Kitsap County Extension: 360-337-7224	Washington State University Mason County Extension: 360-427-9670 x 396
Jefferson County Environmental Health Department: 360-385-9400	Kitsap County Health District: 360-337-5235	Mason County Health Department: Shelton: 360-427-9670 Belfair: 360-275-4467
Jefferson County Community Development: 360-379-4450	Kitsap County Department of Community Development: 360-337-7181	Mason County Department of Community Development: 360-427-9670 ext. 352
Jefferson County Solid Waste Division: 360-385-9243	Kitsap County Solid Waste: 360-337-5777	Mason County Solid Waste: 360-427-5271
Jefferson Noxious Weed Control Board: 360-379-5610 ext. 205	Kitsap County Noxious Weed Control Board: 360-337-7157	Mason Noxious Weed Control Board: 360-427-9670 ext. 395
Jefferson County Conservation District: 360-385-4105	Kitsap County Conservation District: 360-337-7157	Mason County Conservation District: 360-427-9436
Washington Sea Grant in Jefferson County: 206-543-1225	Washington Sea Grant in Kitsap County: 360-337-7170	Washington Sea Grant in Mason County: 360-432-3054

Puget Sound Action Team
800-54-SOUND
http://www.psat.wa.gov

Washington Dept. of Fish and Wildlife:
360-902-2200
http://www.wdfw.wa.gov

Washington Department of Ecology
360-407-6000
http://www.ecy.wa.gov

Hood Canal Salmon Enhancement Group, Belfair WA
360-275-3575
http://www.hcseg.com

Marine Biotoxin Hotline
800-562-5632
http://www.doh.wa.gov/ehp/sf/biotoxin.htm

Call 800-OILS-911 if you see a change in fish behavior, algae blooms, an oil spill or dead fish in or near Puget Sound.

SPONSORS

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PUGET SOUND ACTION TEAM

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For additional information on the Shore Stewards program, to get more booklets or to request that a Shore Stewards presentation be made at an upcoming community association or group meeting please contact the WSU Jefferson County Extension at 360-379-5610 or Cammy Mills, Shore Stewards Coordinator, at cammymills@jefferson.wsu.edu.

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